Roy G. Biv: How many bands in your rainbow?

Art is the imposing of a pattern on experience. Alfred North Whitehead

We all know our basic colors before we start to school. We learn early on that there are three primary colors (red, yellow, and blue), from which all others can be created, although designers of color printers apparently missed that lesson. The ancients saw five colors (red, yellow, green, blue, violet) in the rainbow. Newton saw seven, adding orange and indigo (perhaps to align with the natural harmony of the universe found in the number of musical notes, days of the week, and known planets; or perhaps he was just buying some vowels.) Recently, indigo seems to have gone the way of Pluto in scientific discourse.

The spectrum can be described much more precisely in tera-Hertz (THz) for frequency or in nanometers (nm) for wavelength than with the rather arbitrary labels roy g biv. Much of the science done on light has been done in the nm or THz metrics\(^1\). But never, in my personal experience, have I heard a mid-life physicist exclaim, “I’m driving a 650nm convertible,” or rhapsodize about “the 650THz bird of happiness on my shoulder.”

The bands we see are the colors our brains have named. Our eyes are physically detecting the full and continuous spectrum of visible light, frequencies of 400 to 790 THz or wavelengths from about 380 nm to about 750 nm. The labels we chose to attach to the spectrum are for our convenience, whether those labels are the

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\(^1\) The figure is plotted against frequency, which is inversely and not-quite-linearly connected to wavelength, to put the colors in the Roy G. Biv order to avoid the rather awkward mnemonic, Vib Gyor. I’m not even going to try to bring the wave versus particle theories of light into this metaphor.
 qualitative colors from nursery school or the quantitative nanometers from physics lab. Labels of either type are arbitrary but at the same time, necessary and important. We can chose the labeling that is most useful to us for a given purpose, but having chosen, our labels shape the way we think about light without altering its physical realities.

The color bands give the spectrum qualitative meaning; the wavelength metric gives the spectrum quantitative precision. Educators should edit the previous sentence by replacing color with Performance and wavelength with Scale Score and try using it in a conversation.

How many performance bands do you see?